

# Effects-based Operations: An Overview



**Dr. Maris “Buster” McCrabb**

**(757) 508-8735**

**Buster@dmmventures.com**



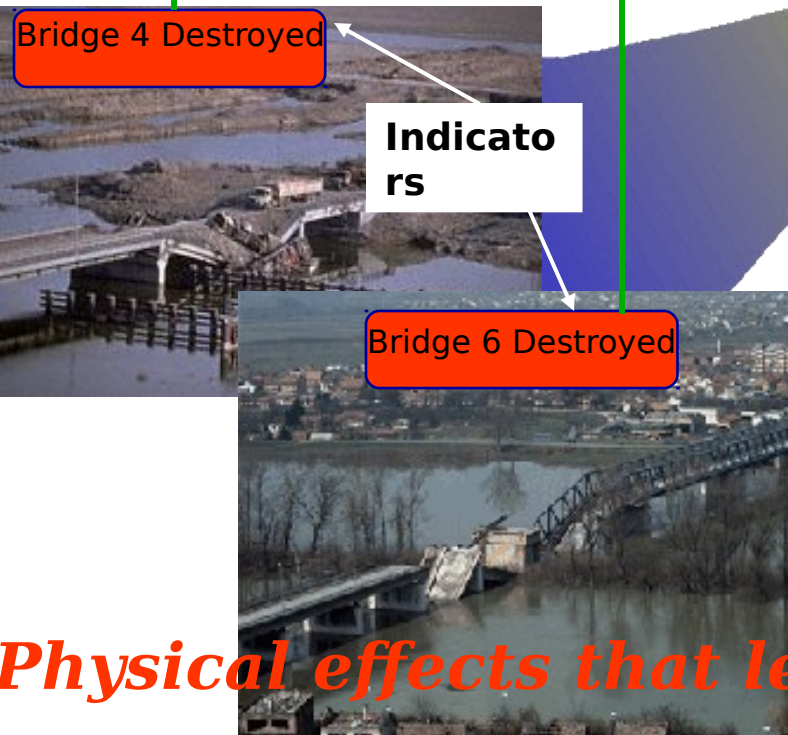
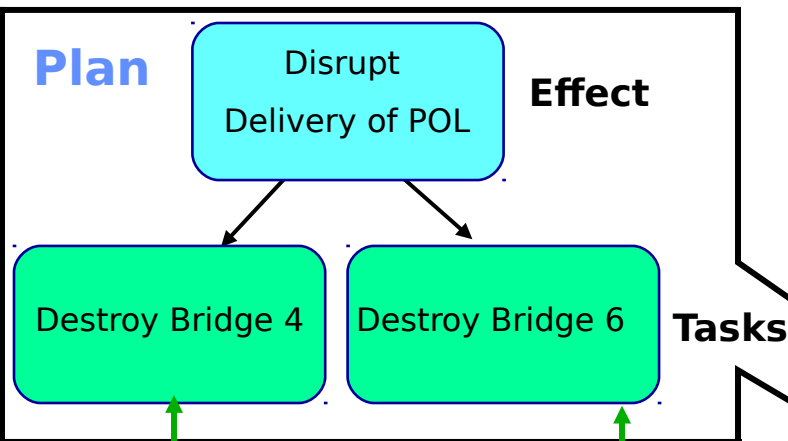
# Overview



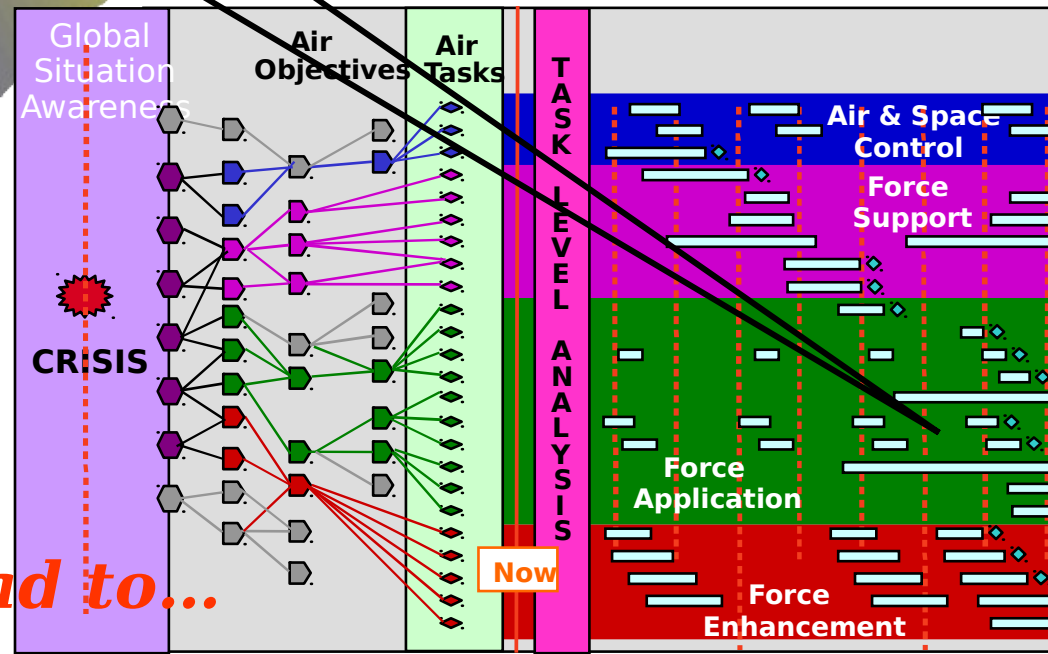
- **Introduction**
- **Definitions**
- **Models**
- **ATD Technologies**
- **EBO in Operation ALLIED FORCE**



# Effects-Based Operations



...desired behavioral out



Physical effects that lead to...



# Effects-Based Operations



"Effects based operations is a methodology for planning, executing and assessing operations to attain the effects required to achieve desired national security objectives." **AFDD 1**

## **EBO ...**

- **is an approach, a way of thinking**
- **supports all missions from HUMRO to MTW**
- **utilizes lethal and nonlethal force**
- **offers an approach that models an "Enemy as a System"**
- **offers Economy-of-Force**
- **offers an approach to *Effects-based Dynamic ISR Management***

***The challenge is predicting & assessing what physical actions***



# Comparison of Effects-Based, Objectives-Based and Targets-Based Operations



## Target-Based (TBO)

- ID enemy entities, destroy them
- Focus: physical effects at target level
- Looks at 1st and 2nd order effects only
- No dynamic assessment
- No explicit timing considerations

## Objectives-Based (OBO) (Strategies-to-Task)

- Strategies at one level become objectives for the next level
- Focus: objectives at every level
- Considers linkages between objectives and strategies to achieve those objectives
- No dynamic assessment
- No explicit timing considerations

## Effects-Based (EBO)

- Address causality between actions and effects
- Focus: desired effects (physical and behavioral)
- Encompass both target and objective-based operations
- Models the enemy-as-a-system w/adversary response
- Considers Direct, Indirect, Complex (synergistic) effects
- Cumulative & Cascading effects
- Timing explicitly considered
- “Overcoming” mechanism stated & assessed



# Definitions



- **No doctrinal template in approved Joint doctrine**
  - **USAF Doctrine has rudimentary definitions**
- **Physical => Behavioral**
  - **destroy (damage), disrupt (Kosovo), degrade, dislocate, decapitate, divert, delay (isolate), deny (halt), deceive, defend, deter (D<sup>11</sup>)**
  - **coerce: punish, threaten (George, Schelling)**
- **Historically and theoretically behavioral most important but hardest**
  - **therefore, traditionally military operations focus on physical effects**
- **Major problems with behavioral effects:**
  - **causality between action & effect**
  - **observability of effect**
  - **uncertainty of intervening variables**



# AFDD 2-1 Definitions



- **Direct Effect**
- **Indirect Effect**
- **“Effects” described**
- **Limitations:**
  - **Precise definitions of “effects”**
  - **Effects versus Objectives**
  - **Conflating Mechanism**
  - **Connections between Direct & Indirect Effects**
  - **Complex or Cascading Effects**



# AFDD 2-1 Definitions



- **Direct Effect:** “Result of actions with *no intervening effect or mechanism* between act and outcome. Direct effects are usually immediate and easily recognizable.” (AKA 1st order effect)
- **Indirect Effect:** “Result created through an *intermediate effect or mechanism* to produce the final outcome, which may be physical or psychological in nature. Indirect effects tend to be delayed, and may be difficult to recognize.” (AKA 2nd, 3rd, ..., *n*-order effects)

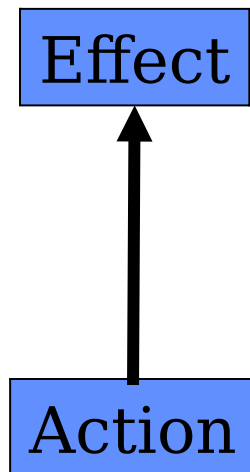




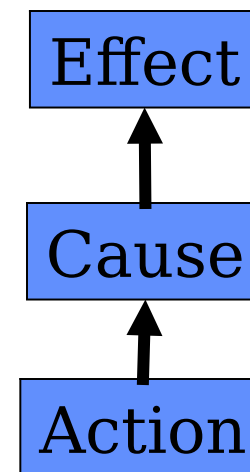
# Effect



- **A result from some action**
  - **Assumes a causal connection**
  - **“IF x THEN y” is a statement of (direct) effect**
- **Point of View dependent**



AFDD 2-1



EBO CONOPS



# Mechanism



- **Actions Cause Results (Effects)**
- **Mechanism explains cause**
  - **Rationale explains purpose (Commander's Intent)**
- **IF (x; action) THEN (y; result) BECAUSE (a, b, ... ; mechanism)**
  - **Uncertainty in action, result and cause suggest a probability-based approach (Bayes)**
- **Clausewitz: if you defeat an enemy's fielded force, then a rational leader will submit because his country is undefended.**
- **Douhet: if you terrorize the population, then a rational leader will submit because the populace will rise up, rebel, and force submission.**



# Mechanism continued



- **Slessor:** if you **interdict infrastructure** or supply, then fielded forces will be less combat capable, making them easier to defeat which leads to...an undefended country.
- **Schelling:** if you **threaten** things **leadership** value, then they will submit rather than lose those things.
- **Warden:** if you **isolate leadership**, then they are prevented from doing something which would thwart our will. They submit because the imposed paralysis prevents them from doing otherwise.



# Mechanism finished



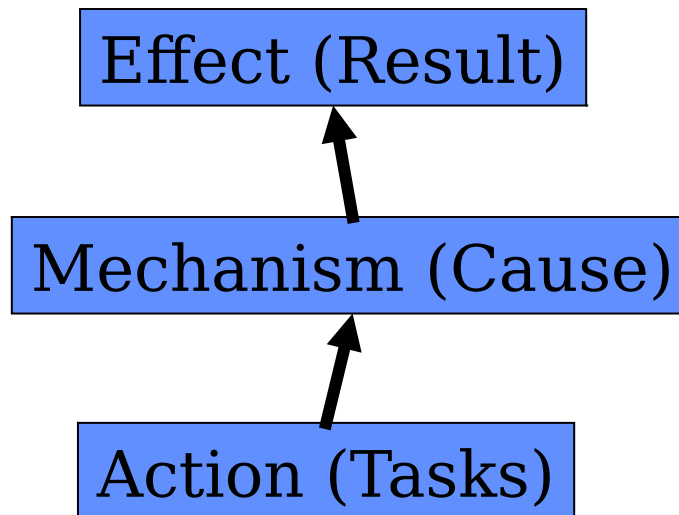
- **In reality these are few, if any, single mechanisms at work.**
  - **Direct and indirect effects combine to form complex and cumulative effects**
  - **Effects cascade for good or ill**
- **Predicting, then assessing, how physical actions spawn behavioral effects (i.e., results from actions) is *the* major challenge.**



# Actions & Tasks



- **Tasks are work (actions) to be done**
  - **Operationally, tasks are normally assigned to tactical units (squadrons, brigades, CVBGs, etc.)**
- **EBO theory is agnostic to the originator of action**

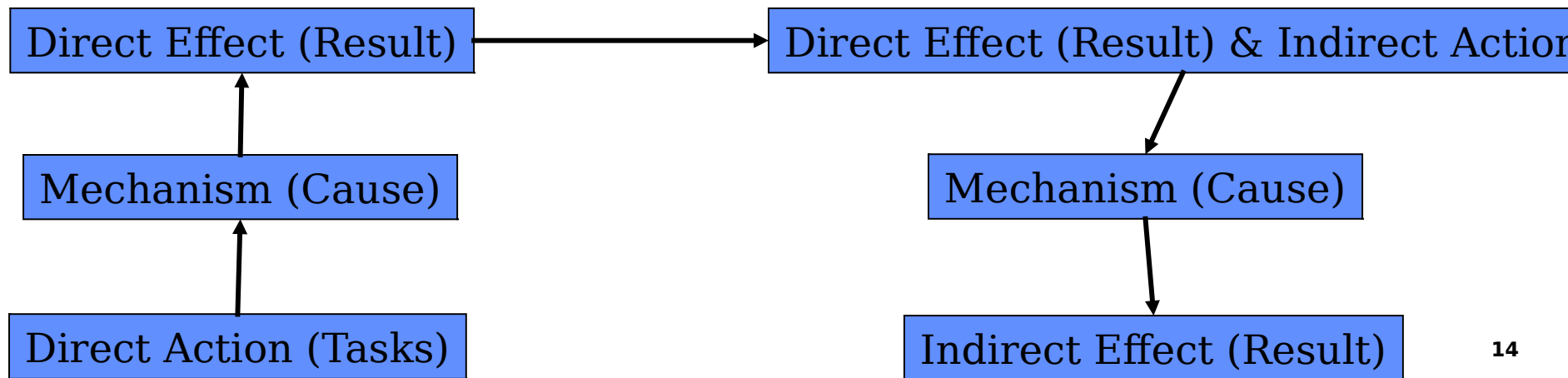




# Direct & Indirect Effects



- **Direct Effects result from (caused by) direct actions.**
- **Indirect Effects result from (caused by) indirect actions.**
- **Indirect actions may be the result of a (previous) direct effect.**

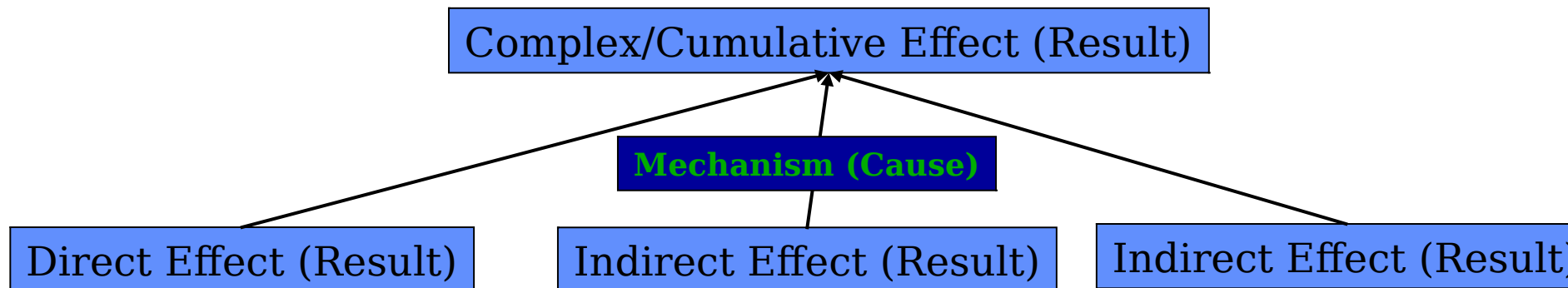




# Complex & Cumulative Effects



- **Complex Effects are a combination of effects, either direct or indirect, at an instant in time & space.**
  - **Mechanism explains how these effect combine**
- **Cumulative effects are complex effects as viewed over some time interval.**
  - **Effects do have persistence, though that generally varies**





# Cascading Effects

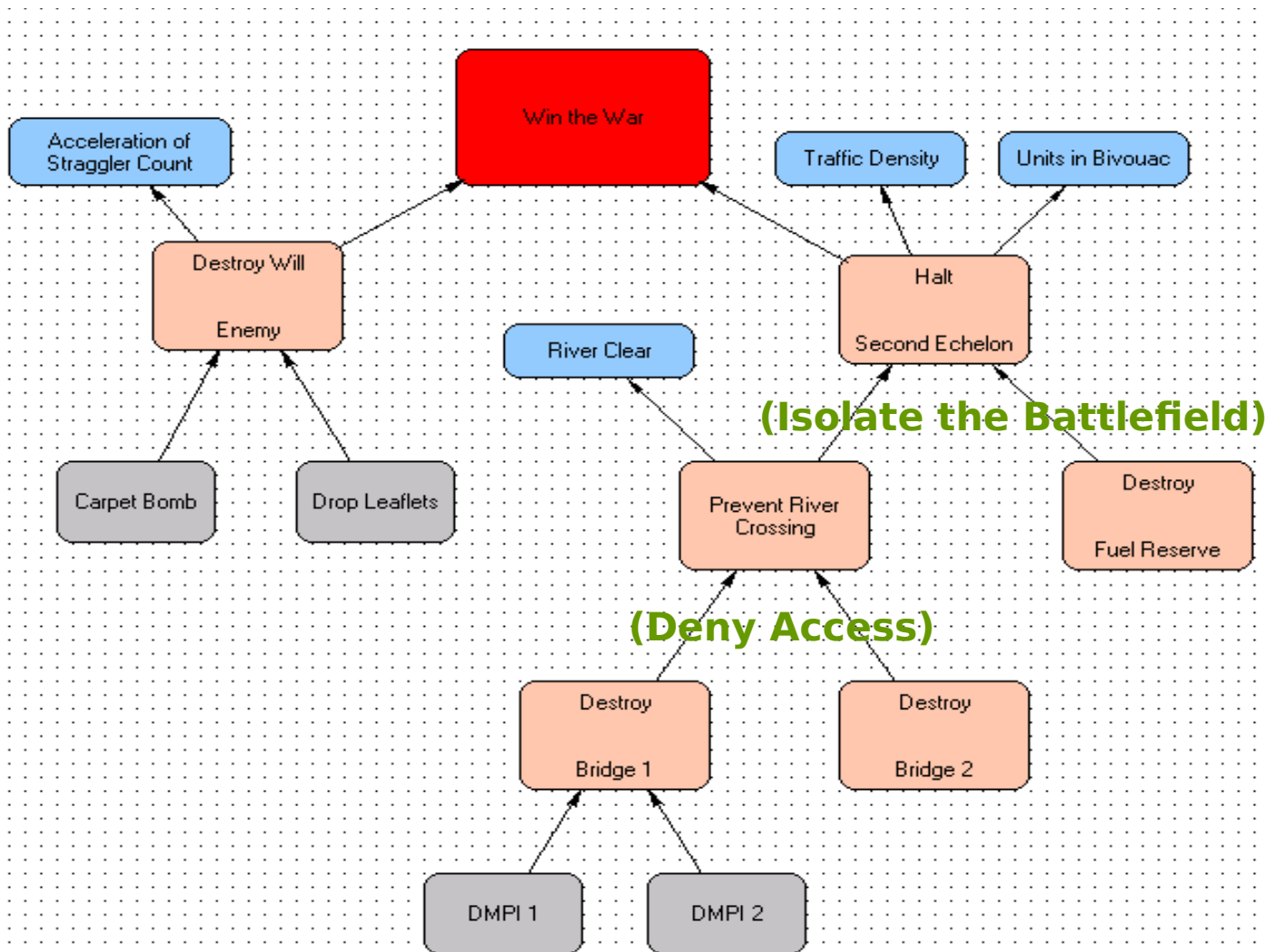


- **Cascading effects are direct, indirect, complex or cumulative effects that ripple through a system**
  - **Captures the notions of an acceleration or a multiplier effect (from economics)**
  - **Requires a systems perspective: relationships, dependencies, or connections between elements**
- **Cascading effects can be vicious or virtuous but which they are is point of view (POV) dependent**
  - **What's bad for the bad guys is good from our POV but bad from theirs**
  - **In a HUMRO, what's good for the object of our attention is good from our POV and theirs**





# Effects-Based Plan Representation



## EBO Terms

- Objective**
- Effect Desired**
  - direct effect
  - indirect effect
  - complex effect
  - cumulative effect

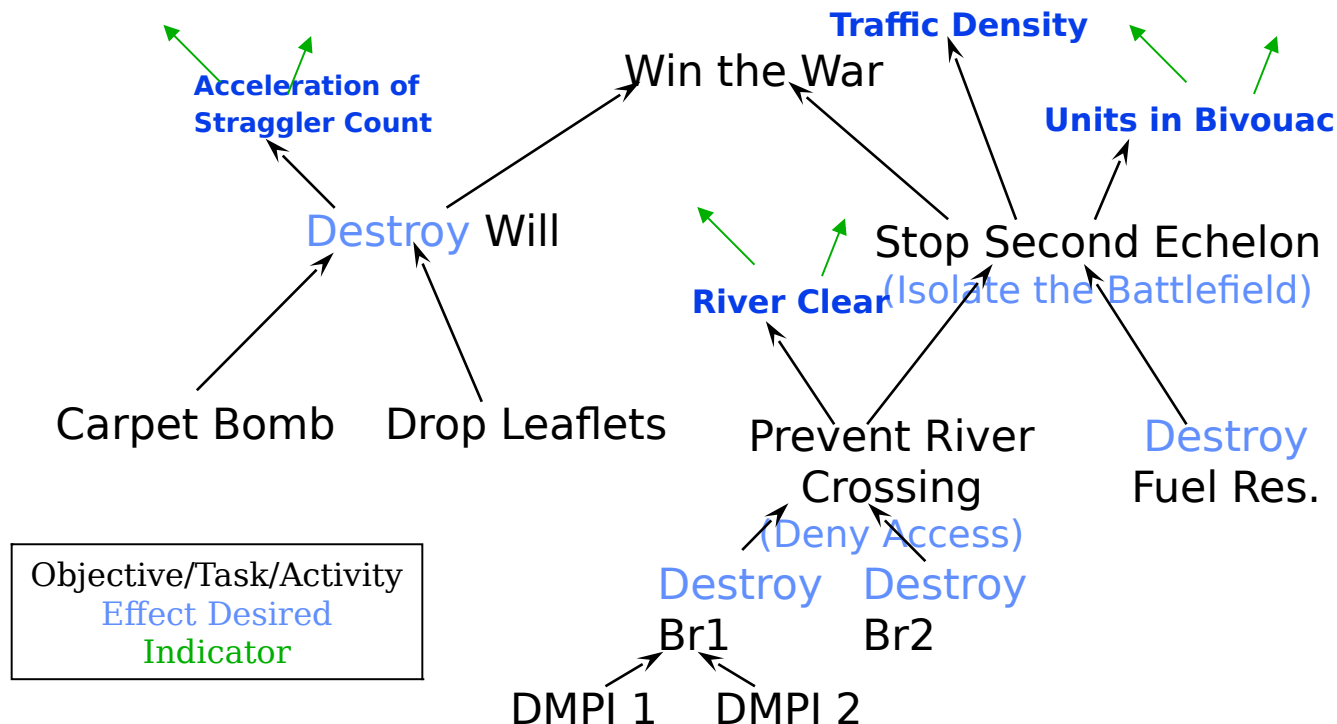
- Indicator**
- Task/Activity**

(Mechanism)



# Indicators

- Are not effects
- Better to be observable then not but “not seen” does not mean “not there”





# Strategy: Definitions



- The art & science of employing the armed forces...to secure the *objectives* of national policy by the application of force or the threat of force. [JP 1-02]
- A *means*<sup>1</sup> to accomplish an end. [AFDD 2-1]
- The use of *engagements* for the object of the war. [Clausewitz]
- The art of distributing & applying military *means*<sup>2</sup> to fulfill the *ends* of policy. [B.H. Liddell Hart]
- A *plan* of action designed in order to achieve some end; a *purpose* together with a system of measures for its accomplishment. [RADM J.C. Wylie]

<sup>1</sup>tool, implement

<sup>2</sup>resources



# Strategy, Objectives & Effects



- **Goal, Strategic Aim, End-State:** the realm of policy—the decisive *results*
  - **An *end-state*** is the set of required conditions that achieve the strategic objectives. [JP 3-0]
- **Operational Art:** determines *where, when & for what purposes* [*why*<sup>2</sup>]...forces will be employed
  - **Use resources efficiently & effectively to achieve strategic objectives** [JP 3-0]
  - **Defines the parameters of operations (restraints & constraints)** [FMFM 1-1]
- **Effects:** the result (outcomes) of direct actions (e.g., missions) and “indirect” actions (e.g., functions) [AFDD 2-1]

<sup>2</sup>rationale



# Ends, Ways, Means, Risk



- **Ends:** What military *conditions* must be produced...to achieve the strategic *goal*?
- **Ways:** What sequence of *actions* is most likely to produce [those] condition(s)?
- **Means<sup>2</sup>:** How should *resources*...be applied to accomplish that sequence of actions?
- **Risk:** What is the likely cost...in performing that sequence of actions

[JP 3-0]



# Strategy, CONOPS & COA



- **A verbal or graphic statement, in broad outline, of a *commander's* assumptions or *intent* in regard to an operation....It is included primarily for additional clarity of purpose. [JP 1-02]**
  - **Commander's Intent: end-state, purpose, method & risk**
- **A plan that would accomplish a mission. Includes CONOPS. Basis for the development of an OPLAN or OPORD. [JP 1-02]**
  - **Tasks—work to be done—given to tactical (engagement level) units to accomplish.**

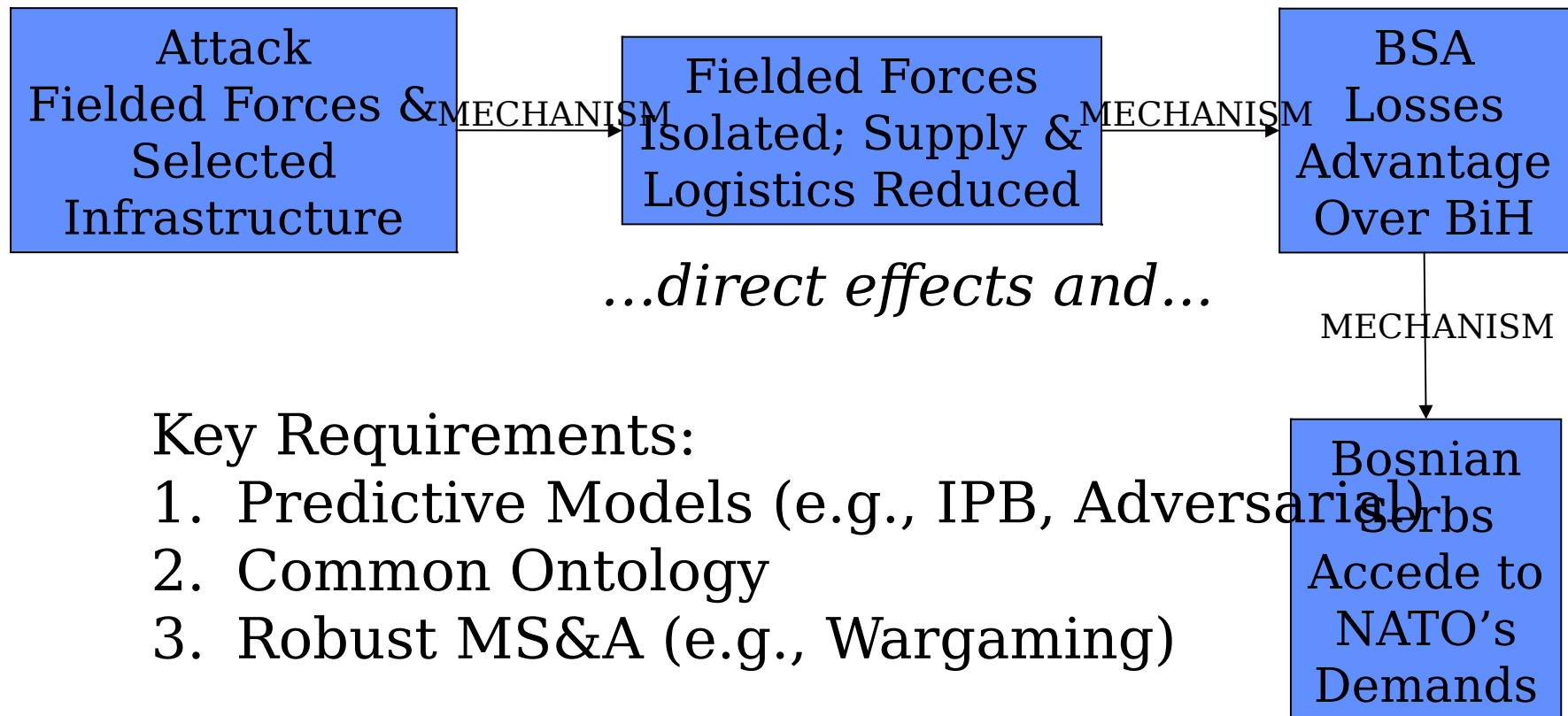


# ***Models***



# Basic Model

*Actions cause..* ***Mechanism explains Cause*** *direct effects*





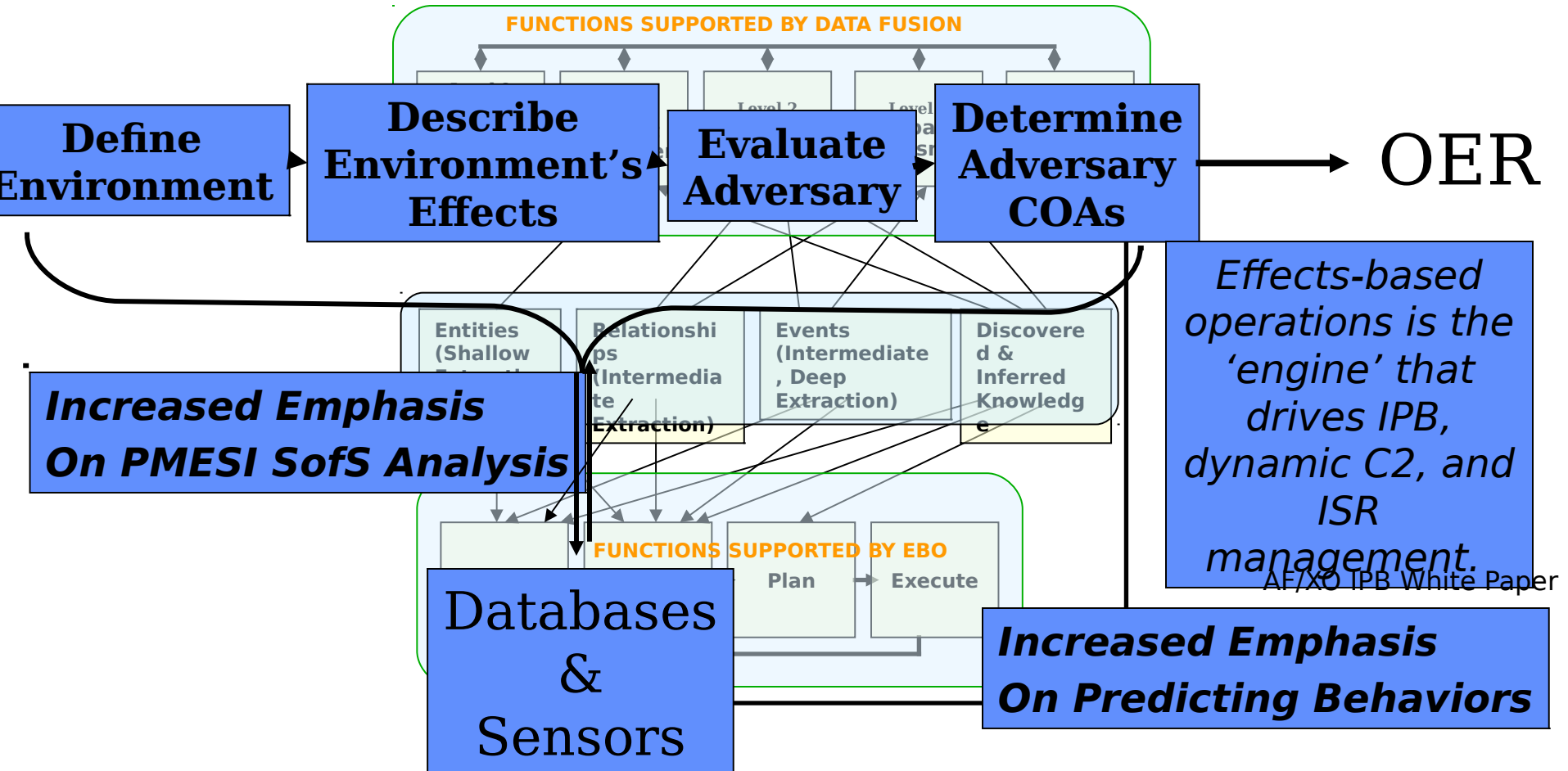


# JIPB, ONA, PBA & EBO



**ONA: JIPB + COA Options (JFHQ Con. Of Employment)**

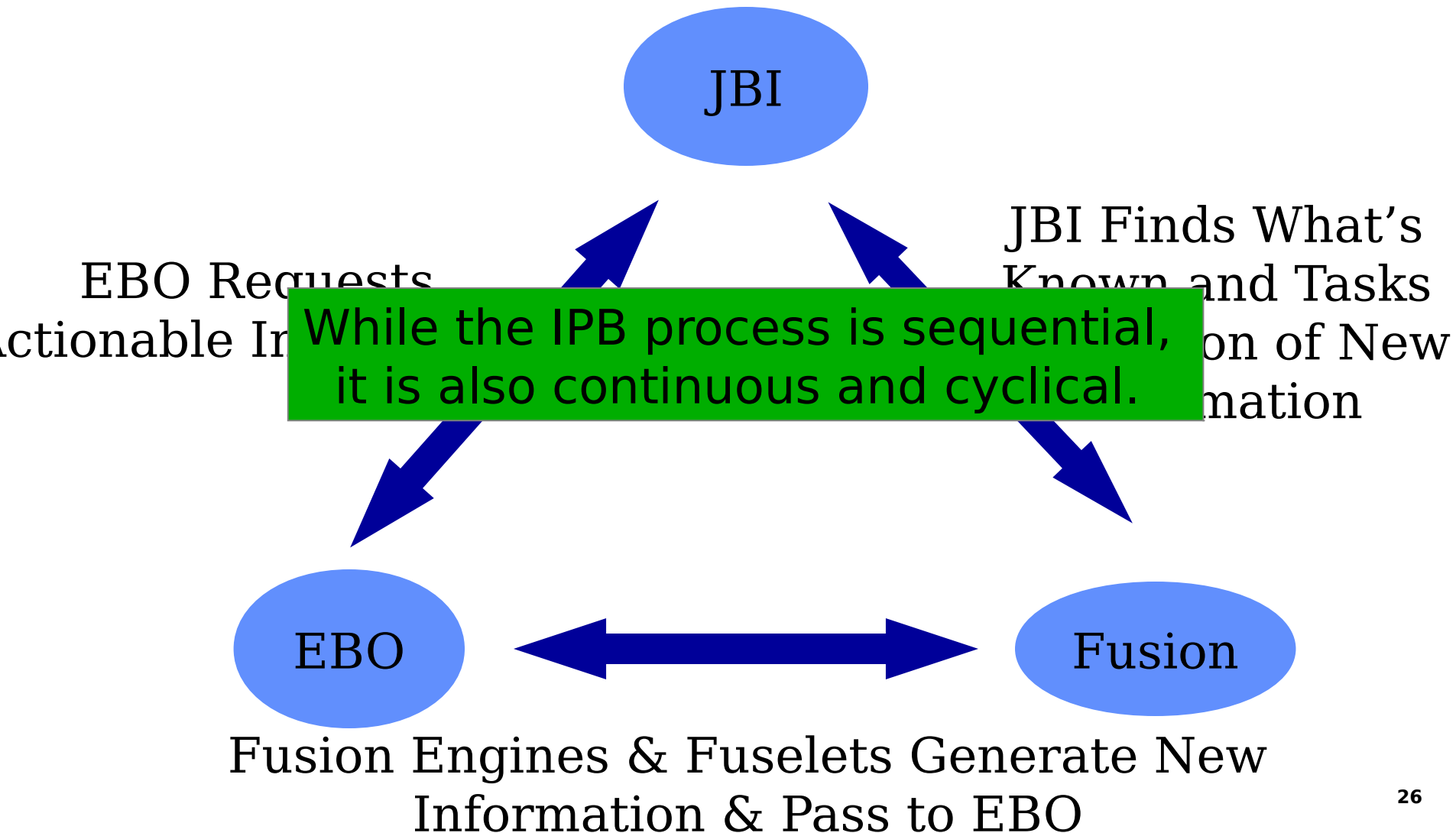
**PBA: JIPB + ISR Planning + ISR Management (PBA CONOPS)**



**Supports JP 3-56.1 Stage I: Operational Environment**



# Working Together



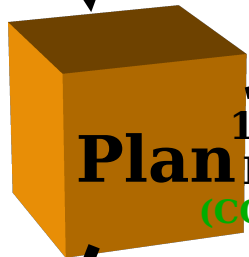


# EBO Macro Model

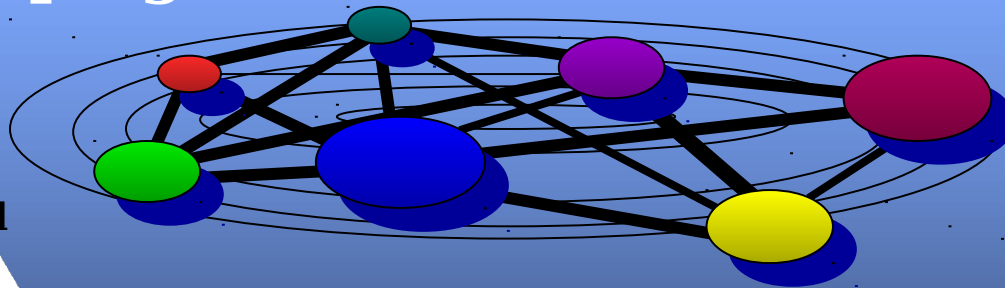
2. Operations  
Anticipated  
Responses

**Campaign**

Predicted Effects



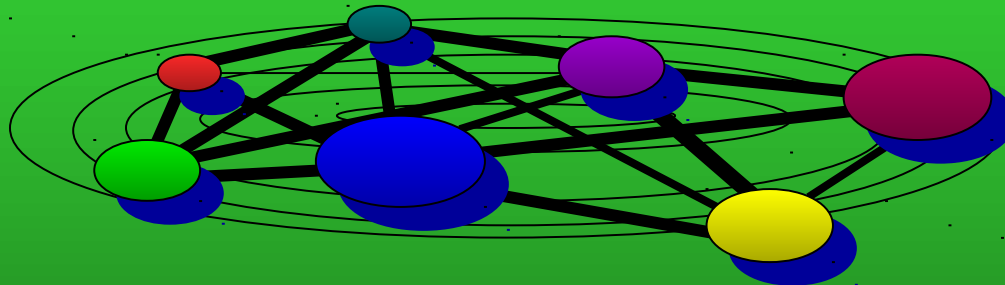
1. Desired  
Behavior  
(COG/TS Level)



**Assess**

Observed Effects

**Combat**

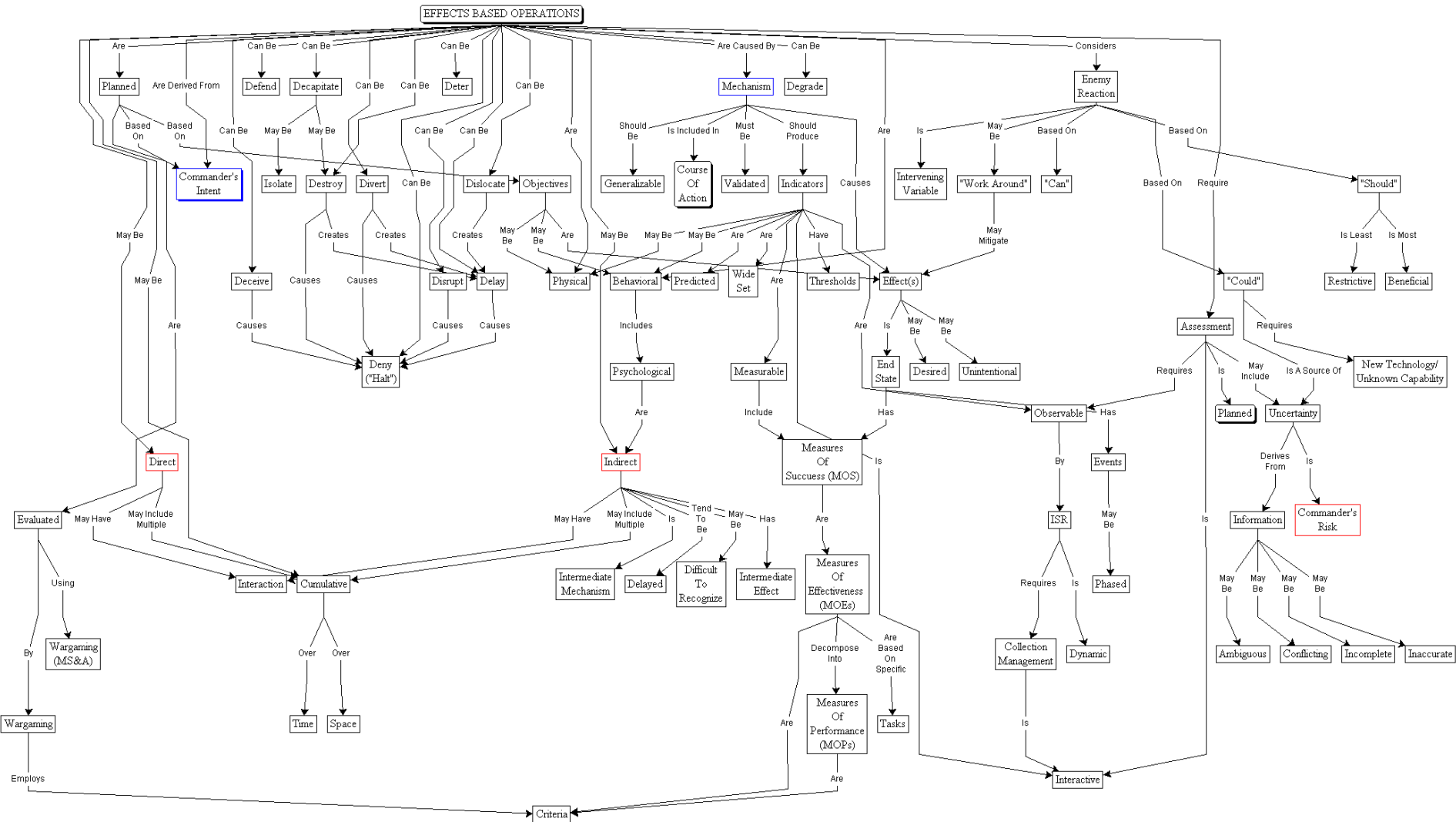


3. Actual  
Operations  
(Target Set /  
Target / DMPI  
Level)

4. Actual  
Responses  
(COG/Target System  
Level)



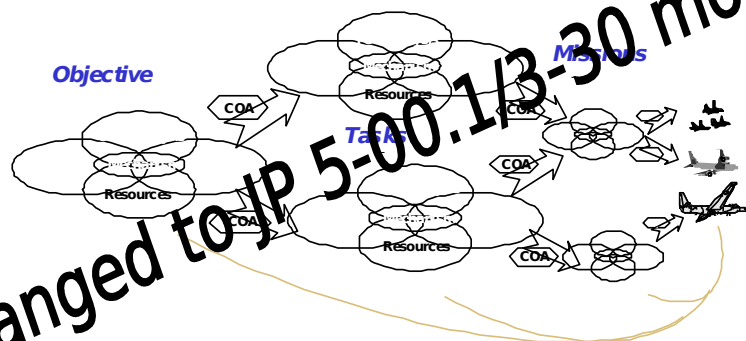
# Semantic Network



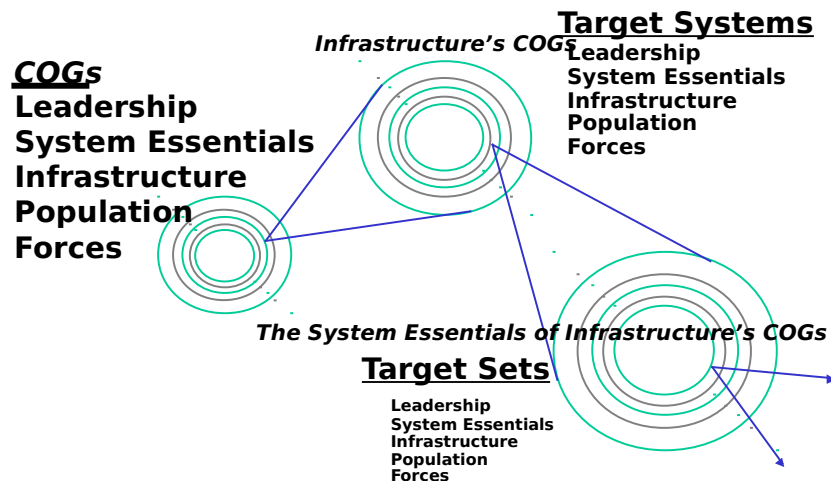


# Approach to Modeling EBO

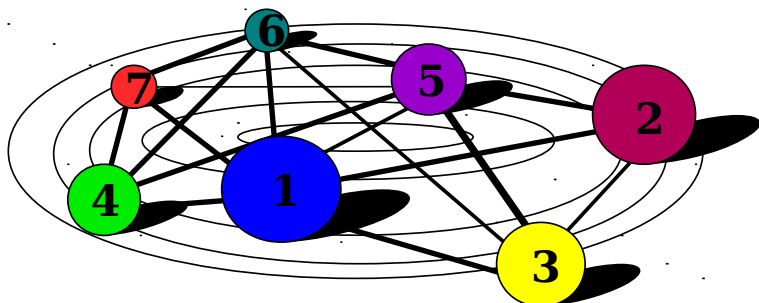
## JP 3-56.1 Campaign Planning Model



## Warden's "Enemy As A System" Model



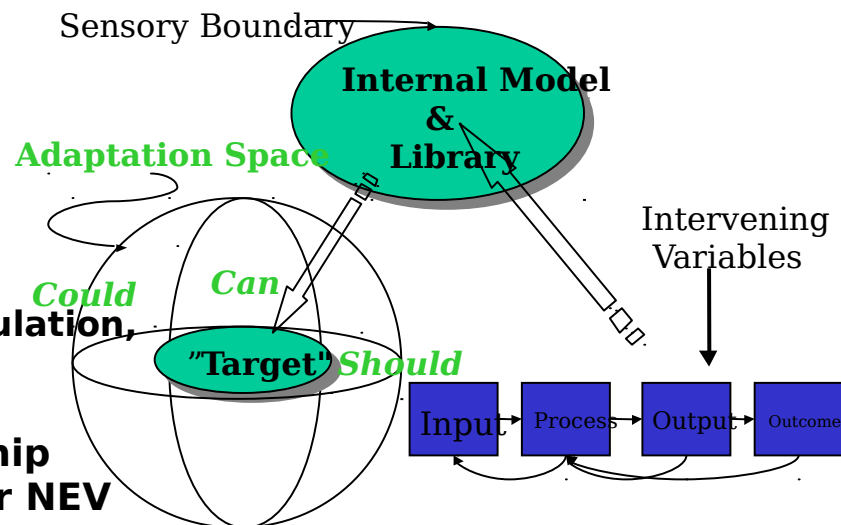
## Barlow's "National Elements of Value" Model



1. Leadership, 2. Industry, 3. Armed Forces, 4. Population, 5. Transportation, 6. Communications, 7. Alliances

Size = Importance of NEV to National Leadership  
Thickness = Importance of Connection to other NEV

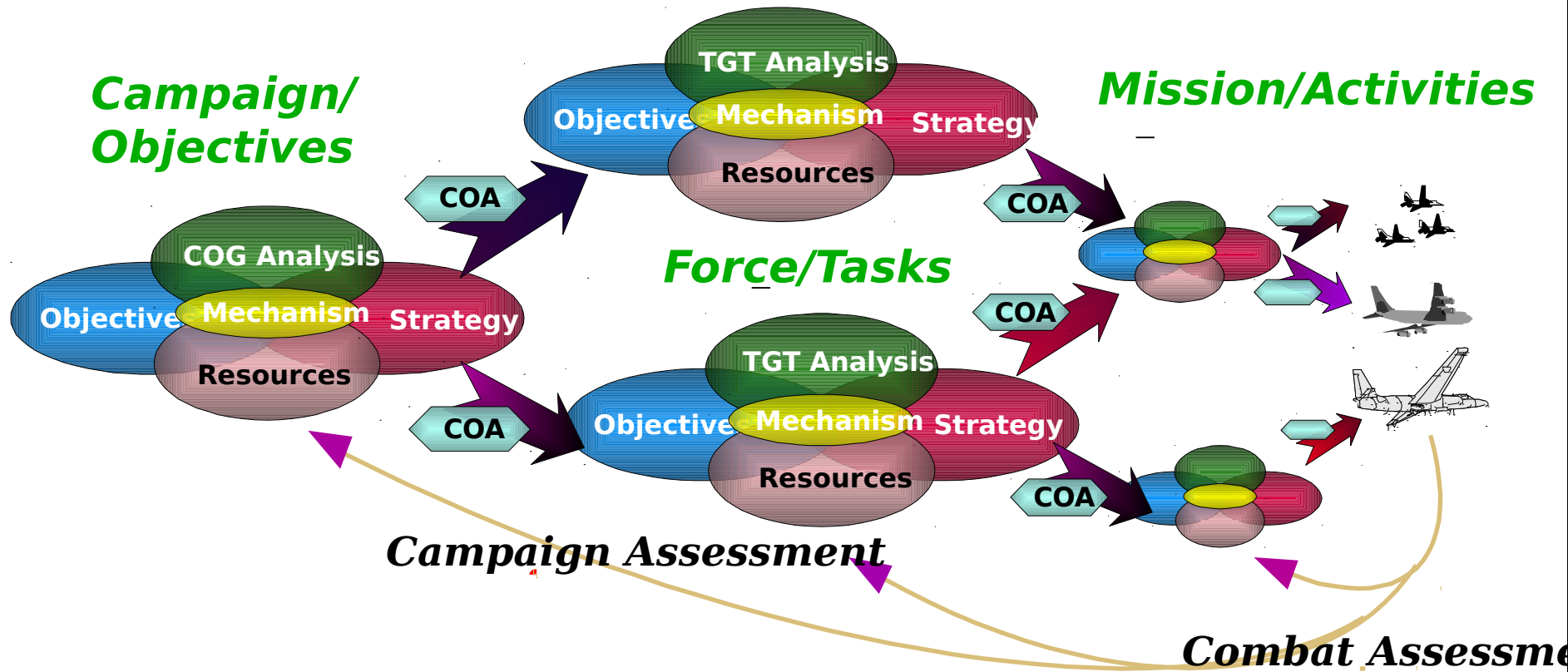
## McCrabb's "Enemy Reactions" Model





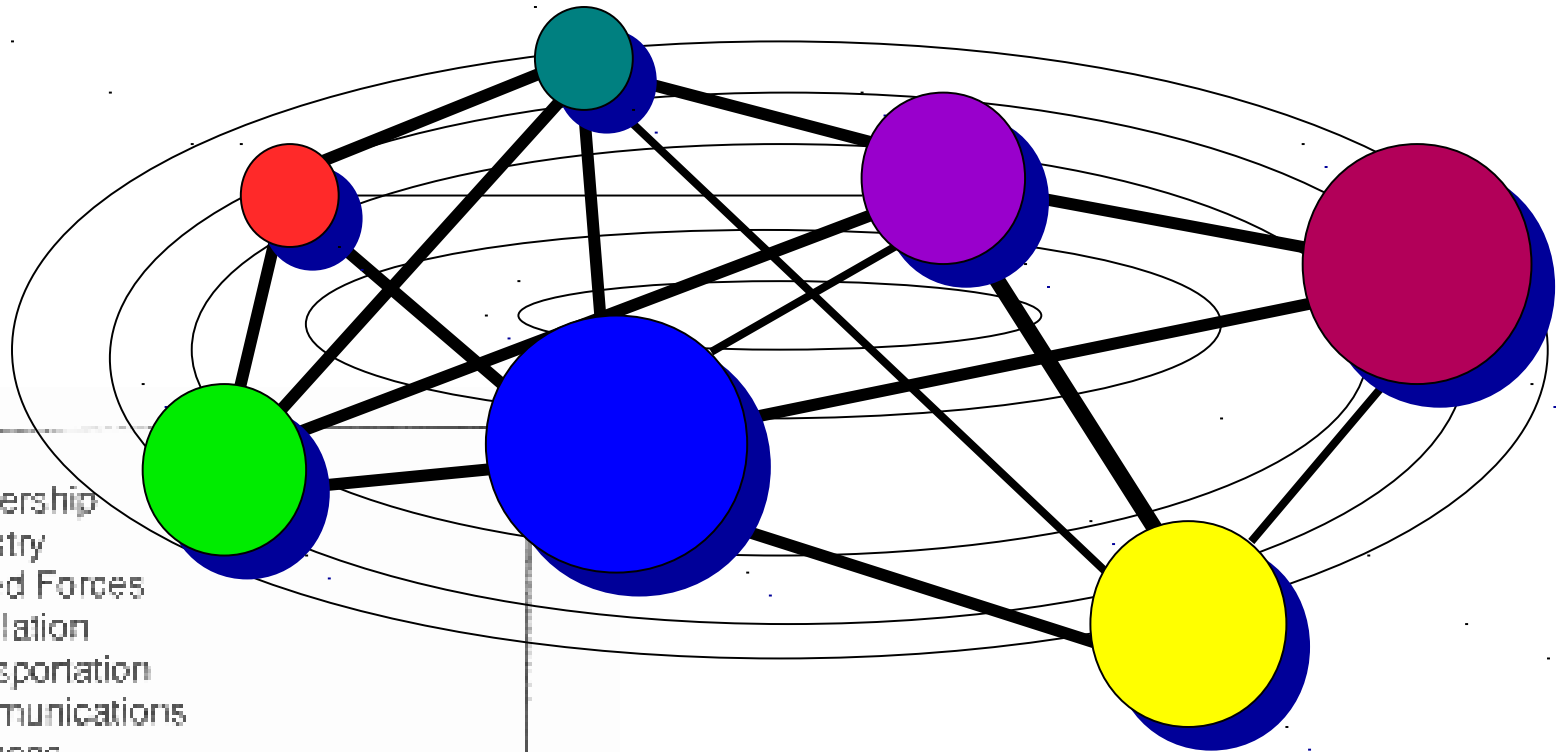
# Campaign Model

## Stage I: OER (IPB)

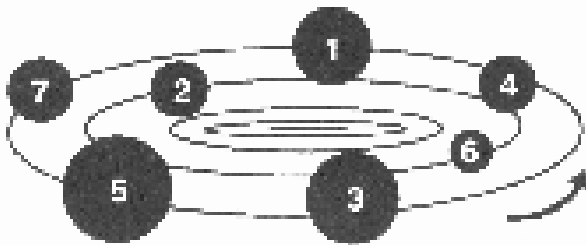




# Barlow's NEVs



1. Leadership
2. Industry
3. Armed Forces
4. Population
5. Transportation
6. Communications
7. Alliances



Stage III: COG Identification

Figure 4. Model of Dynamic National Elements of Value



# Warden's "Rings" (Stage III)



*COGs*

Leadership  
System Essentials  
Infrastructure  
Population  
Forces

*Infrastructure's COGs*

Leadership  
System Essentials  
Infrastructure  
Population  
Forces

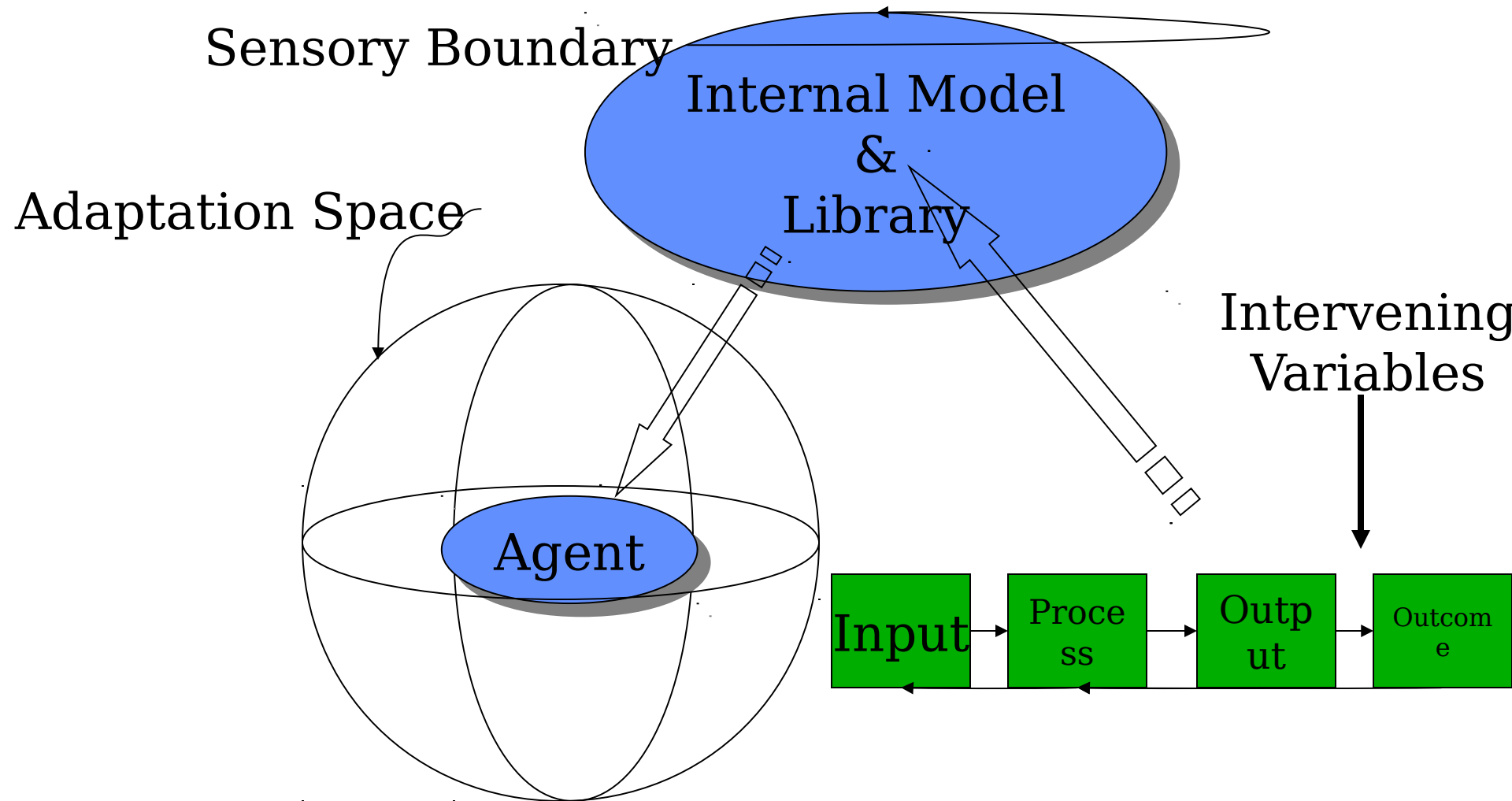
*The System Essentials of Infrastructure's COGs*

Leadership  
System Essentials  
Infrastructure  
Population  
Forces





# McCrabb's Agent Adaptation Space (Stage I-V)





# The (Almost) Complete Puzzle (Stage I-V)



Commander's Intent

Objectives/  
Desired Effects  
(Stage II)

IPB Tools  
& Processes

EBO/DTT  
T&Ps

Branch

Stage V

*Wargaming*  
COA Selected

Enemy COA vs.  
Friendly COA  
(Stage IV)

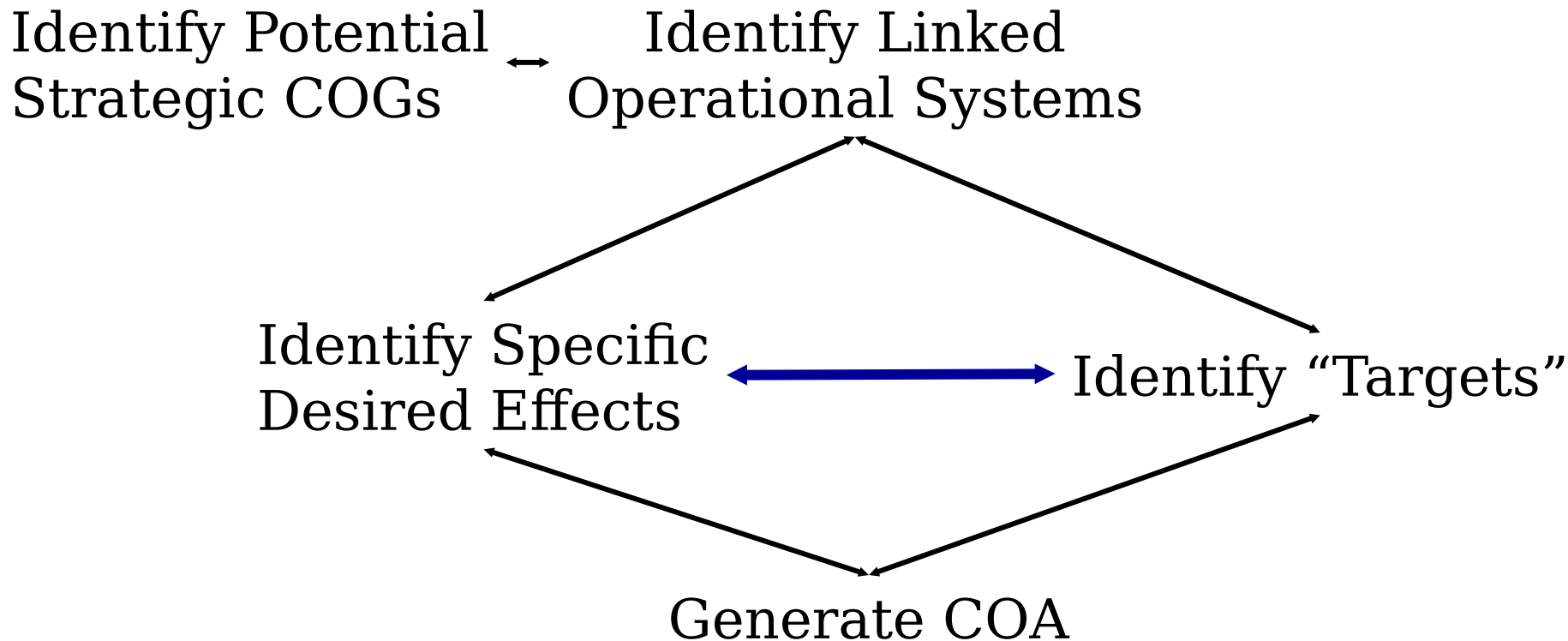
Branch



# Effects-Based Planning



**Everything Starts from Commander's Intent....**

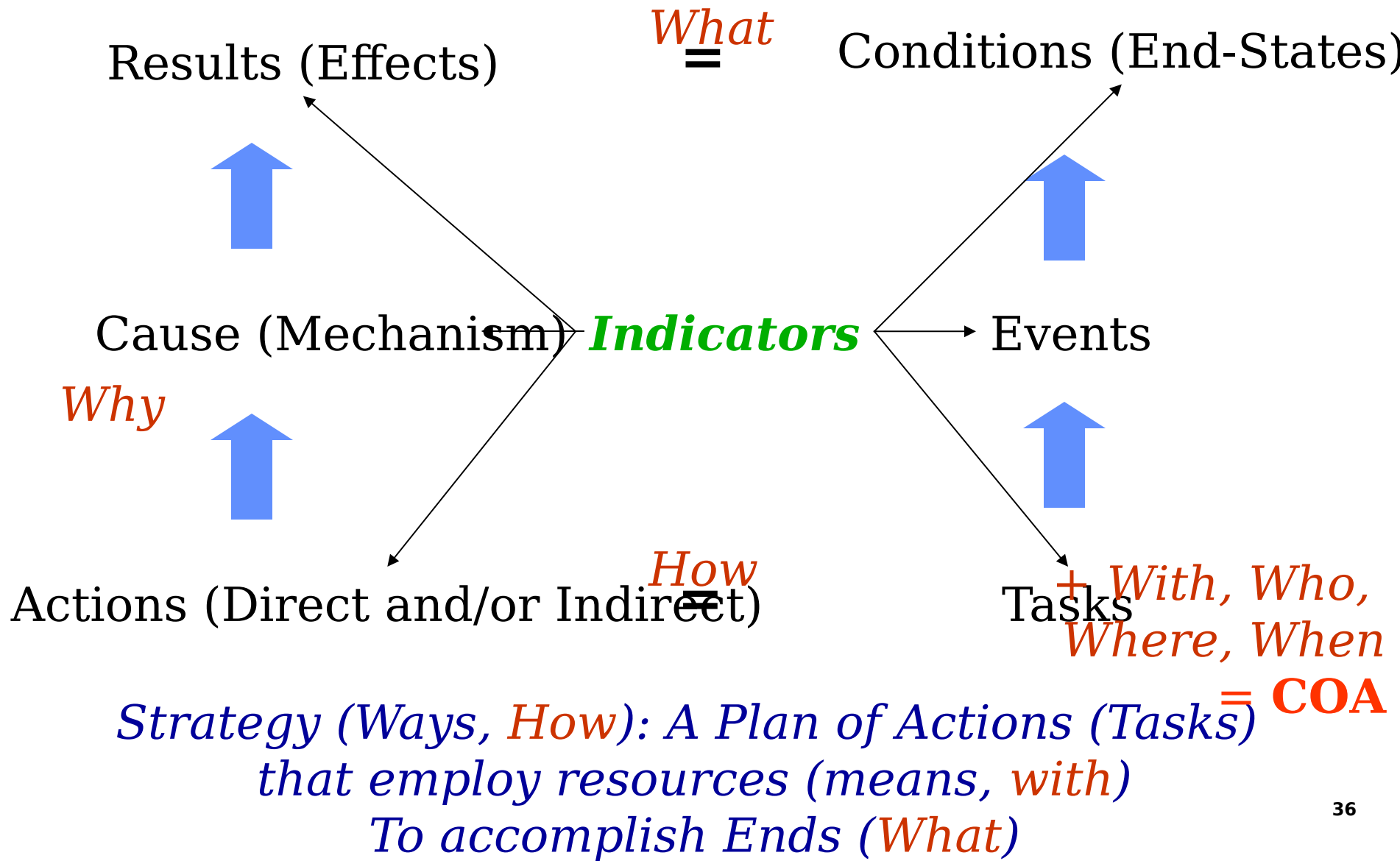


***Supports JP 3-56.1 Stages II-V***

*Modified from Dave Deptula's "Firing for Effect"*

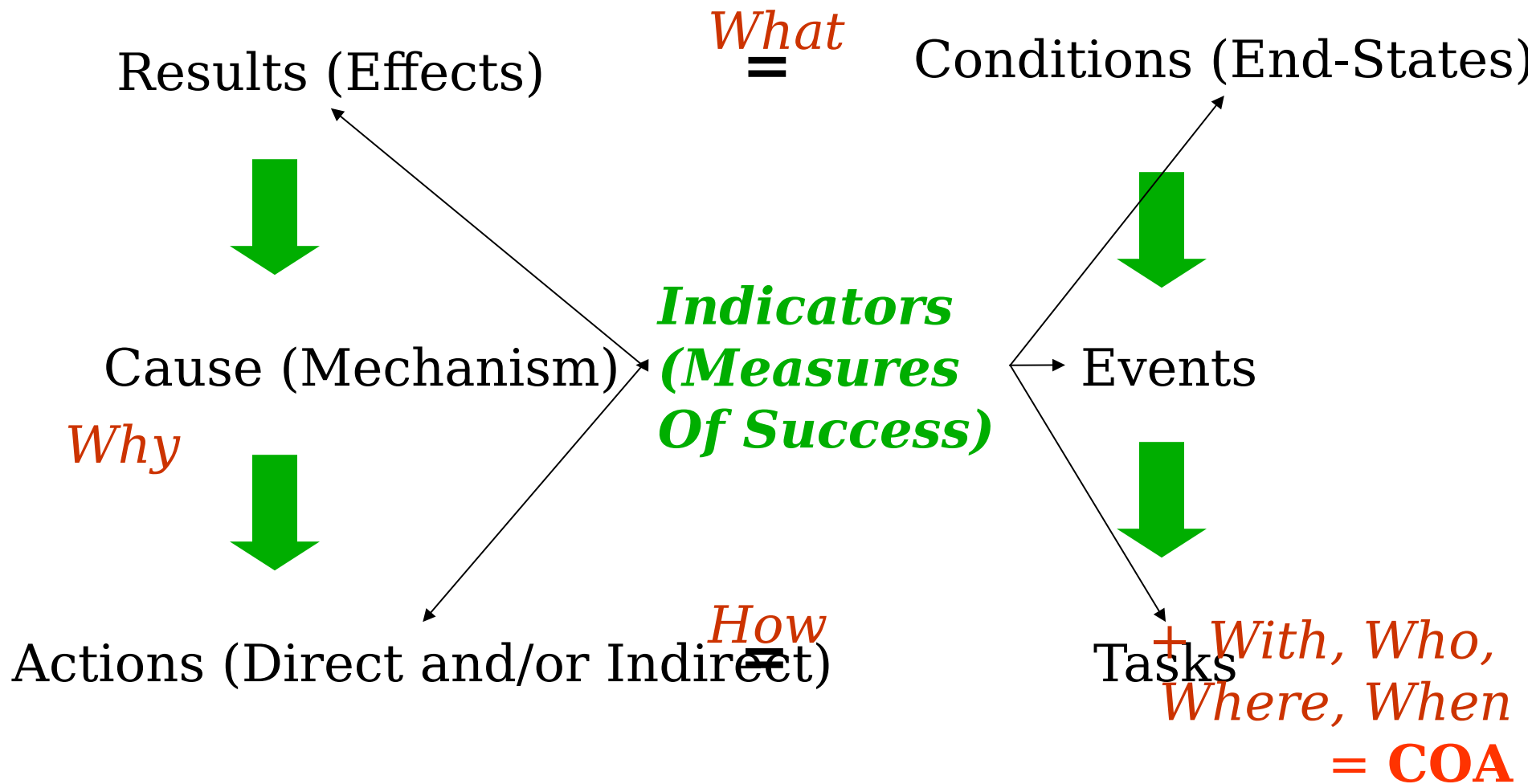


# Effects & Operational Art



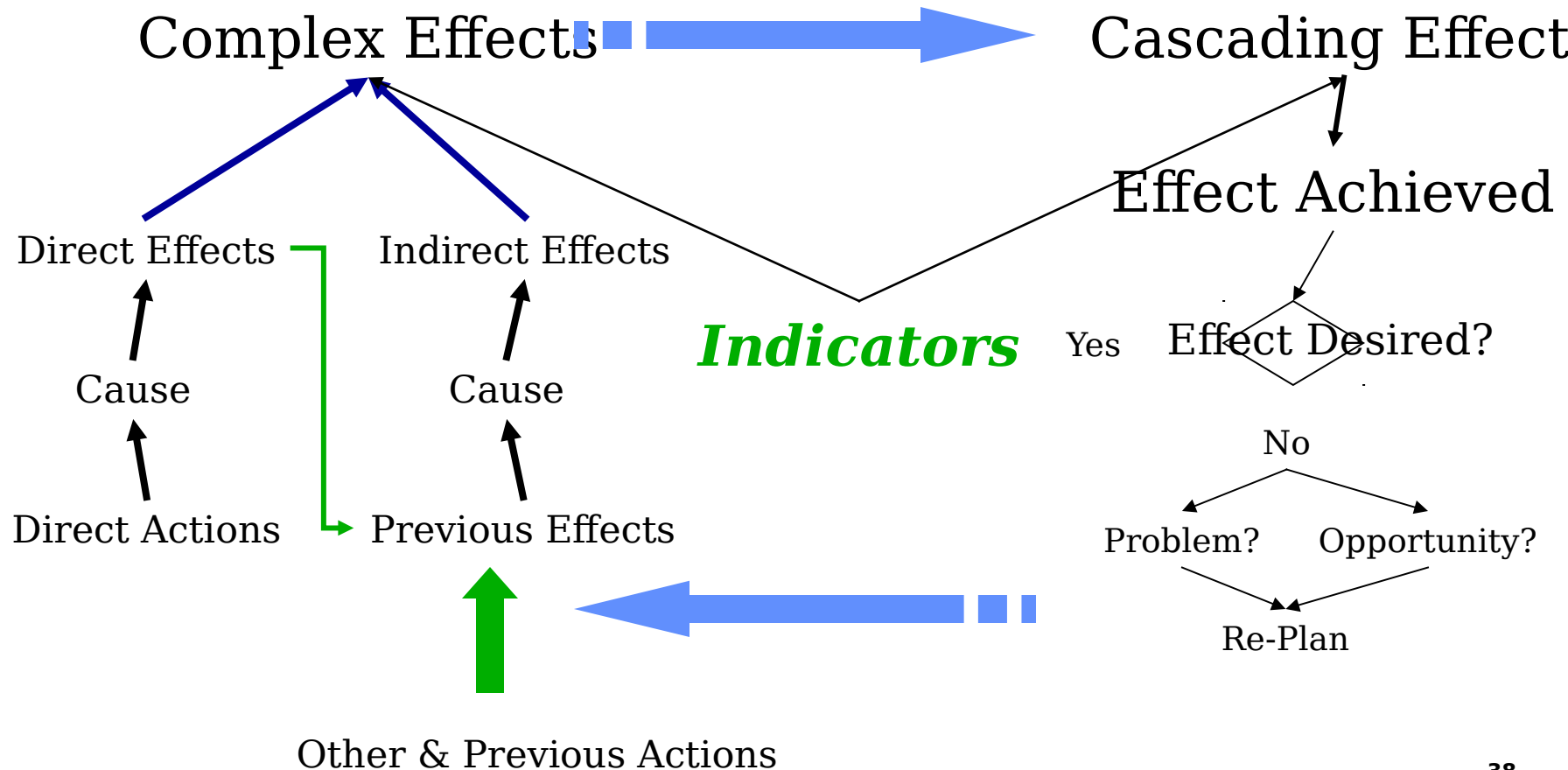


# Planning (Stage V)





# Execution & Assessment



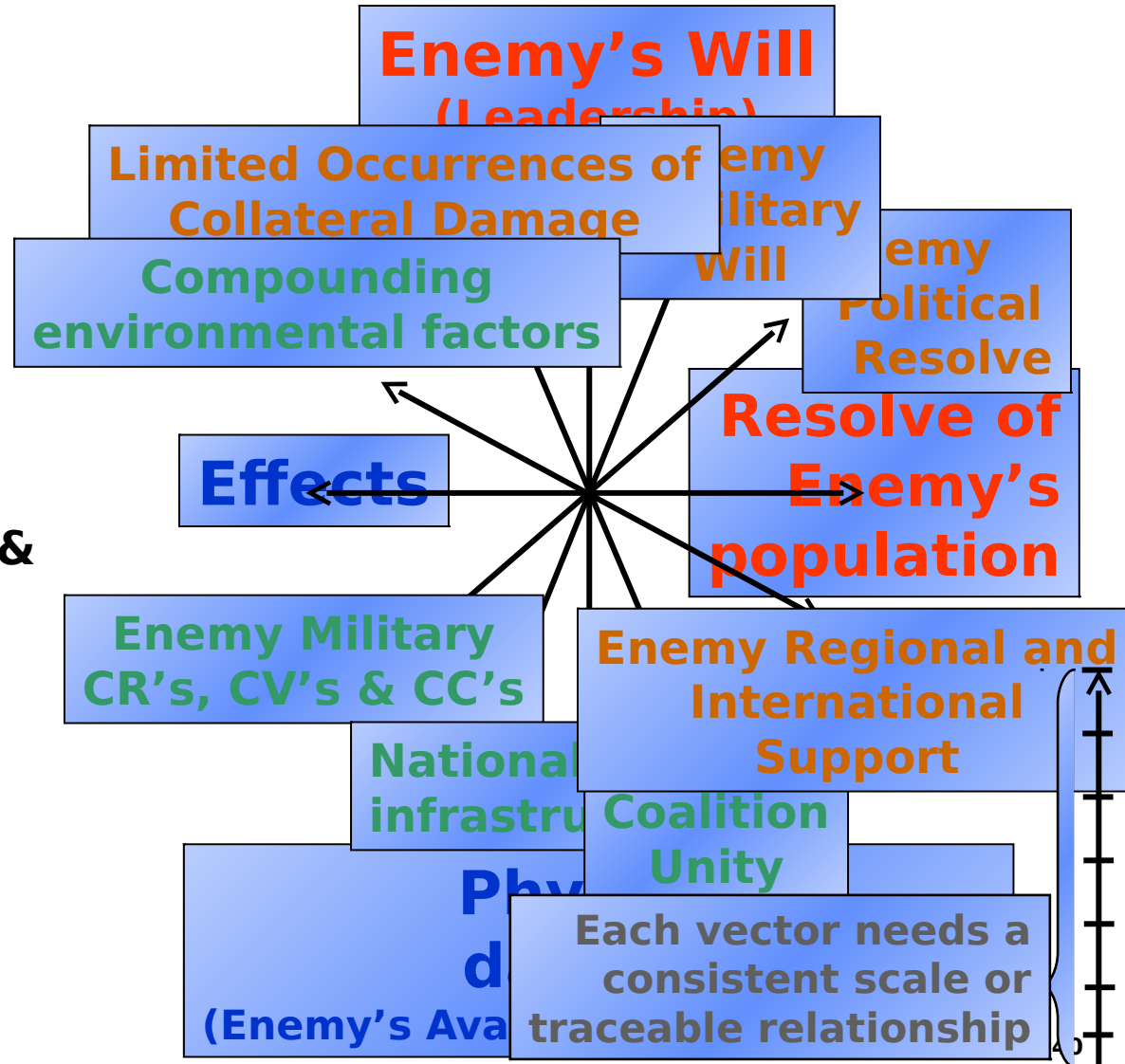




# Big Picture



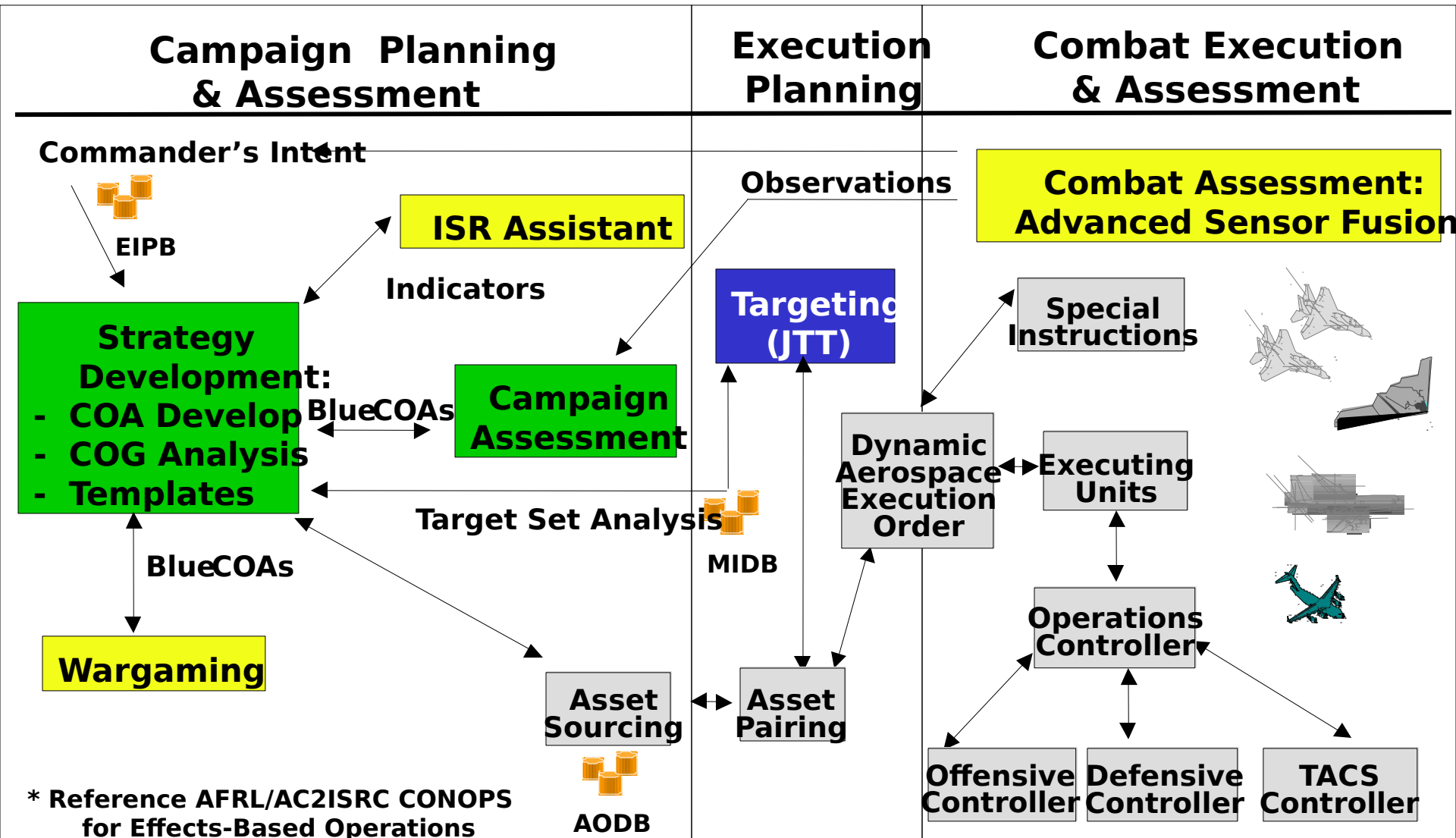
- EBO ATD seeks an integrated set of strategy, wargaming, COG analysis, and campaign assessment tools.
- Doctrinally sound; not dogmatically rigid
- Support EBO planning & assessment plus objectives-based or targets-based assessment
- Major Theater War => Humanitarian Relief; lethal & nonlethal; kinetic & non-kinetic (e.g., Info Ops)







# EBO Toolkit of the Future for Dynamic Tasking





# EBO Key Products

- Strategy Development Tool

- produces blue COAs
- tightly integrates effects, center of gravity/target system analysis & strategy identification
- cross center of gravity interactions
- strategy & mission templates

- Campaign Assessment Tool

- predicts the probability of achieving Commander's intent for a blue COA
- model plan's cause/effects relations for a given campaign over time
- tradeoff analysis/drill down capability

## Strategy Development Tool

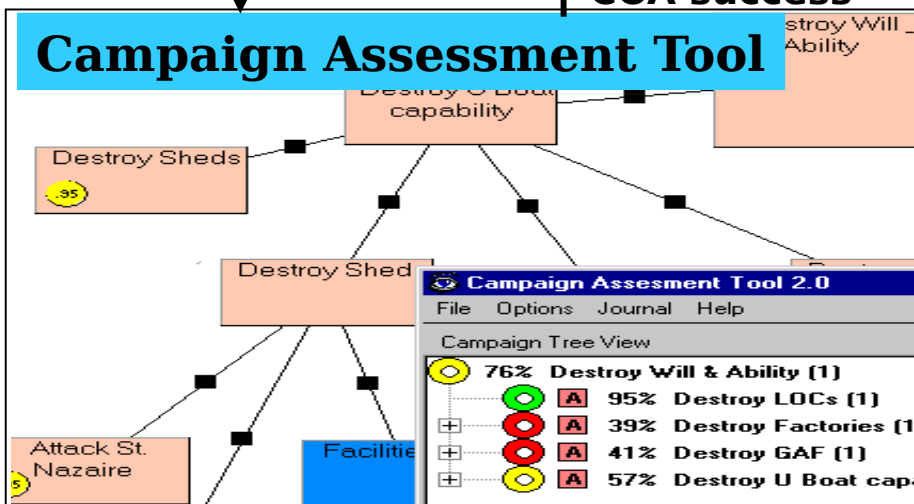
Disrupt TBM deployment	Supported by	Disrupt delivery of POL via route A Disrupt delivery of POL via route B
Disrupt supply of POL to TBM units	Desired Effect	Disrupt delivery of POL to TBM FOBs and TL sites
Disrupt ability to refine POL	Effect	Disrupt delivery of POL to TBM FOBs and TL sites
Disrupt ability to store POL	Where	Via ground LOCs
Disrupt delivery of POL		
Disrupt delivery of POL via route A		
Disrupt delivery of POL via route B		

## Objectives Determination and COG & Target Systems Analysis

Where	for at least 30 hours
When	ground LOCs operational
Red COG Node	less than 10 vehicles traveling from north to south through intersection 7
MOEMOP	Destroy ground LOCs assessed by less than 10 vehicles traveling from north to south through intersection 7
Mechanism/Indicators	interferes with ground LOCs operational which interferes with supply POL to TBM units which supports disrupt delivery of POL to TBM FOBs and TL sites assessed by no POL transportation vehicles seen in location 7

Blue COA

Probability of Blue COA success



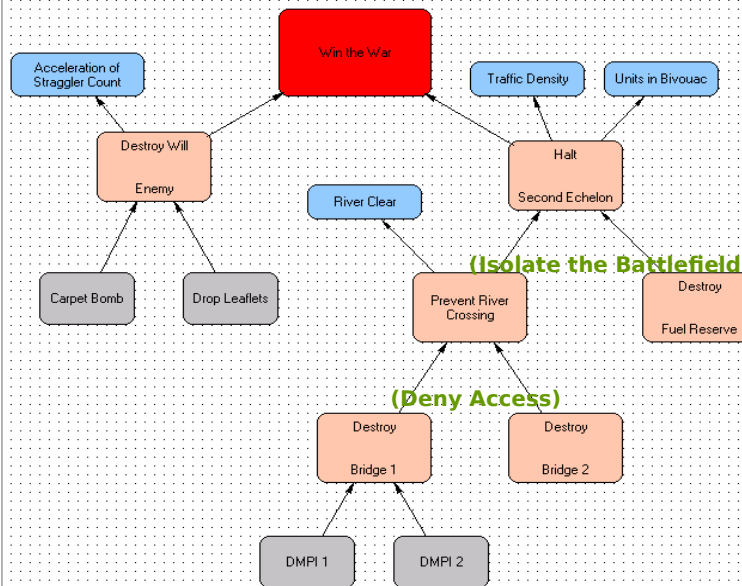


# Strategy Development Tool Overview

File Edit Tools Templates Missions Show Help

File Causal Analysis COG Analysis Map View Plan: New: Edit: Mission Templates:

- Operation Deny Force
  - Prevent Orangeland from deploying WMD
    - Disrupt TBM development/deployment
    - Gain/maintain air superiority
    - Disrupt WMD development
      - Disrupt WMD R&D Facilities
        - Disrupt EP for WMD R&D Facilities
          - Disrupt EP 4 R&D A
            - Disrupt EP from National Grid
            - Destroy Substation A
            - Disrupt EP from Local Generators
          - Disrupt EP 4 R&D B
            - Disrupt EP from National Grid
            - Destroy Substation A
            - Disrupt EP from Local Generators
          - Disrupt EP 4 R&D C
            - Disrupt EP from National Grid
            - Destroy Substation A
            - Disrupt EP from Local Generators
        - Disrupt TBM deployment
        - Disrupt POL supply to TBM units



## Legend

Objective

Effect

Indicator

Task

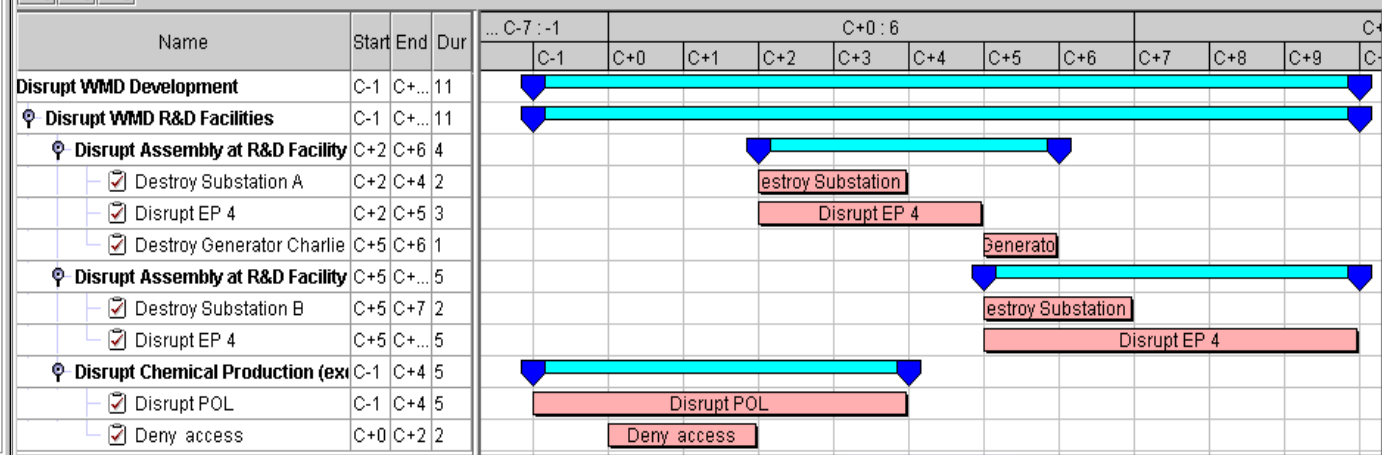
Mechanism

Effect

Name	Disrupt WMD R&D Facilities
Supports	Disrupt WMD development
Supported By	Disrupt EP for WMD R&D Facilities
Tasks	
Effect	disrupt ability to assemble WMDs
Where	within Orangeland
When	for at least 90 day starting at c + 10 day
COG Node	R&D Facilities Operational
Indicator	
MOE	



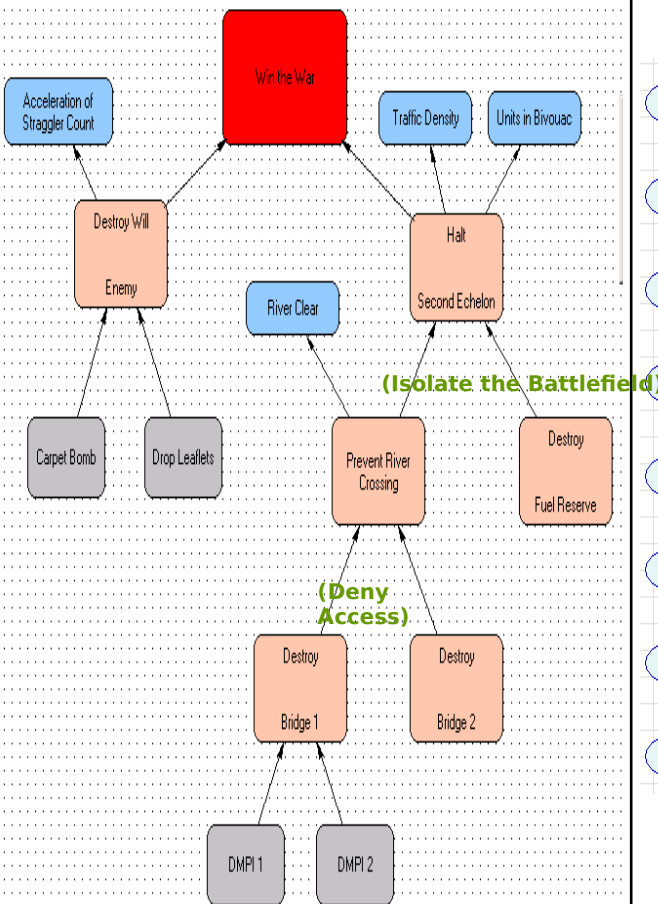
## Task/Activity



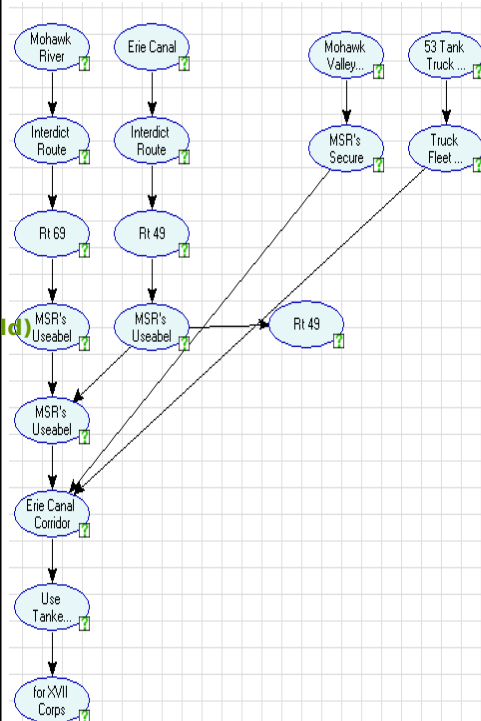


# Campaign Assessment Tool Overview

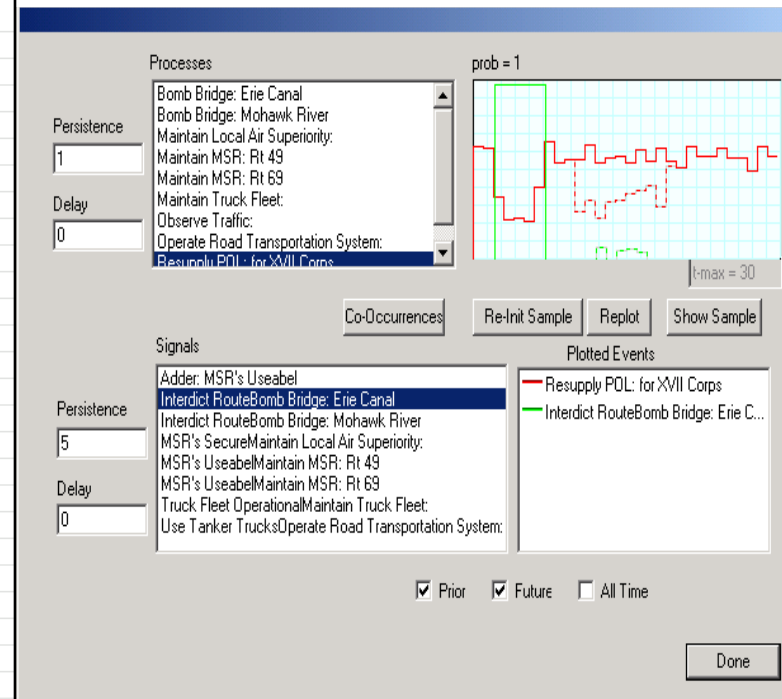
## Build A Causal Model



## Compile to a Bayes Net

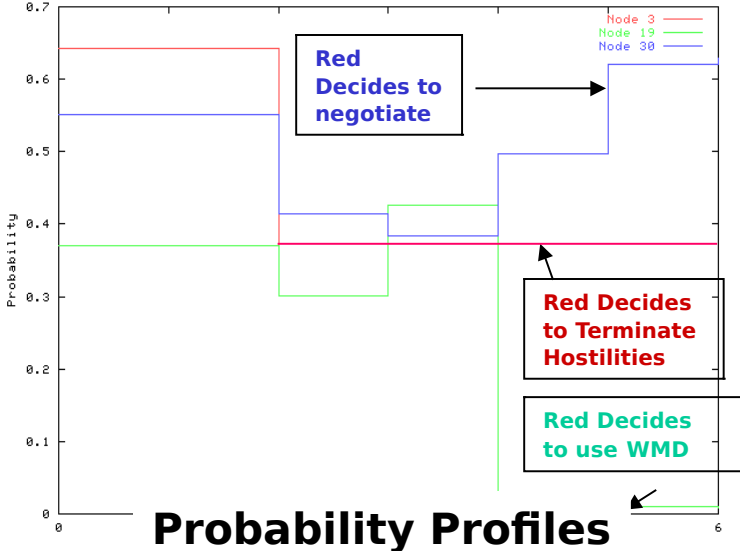
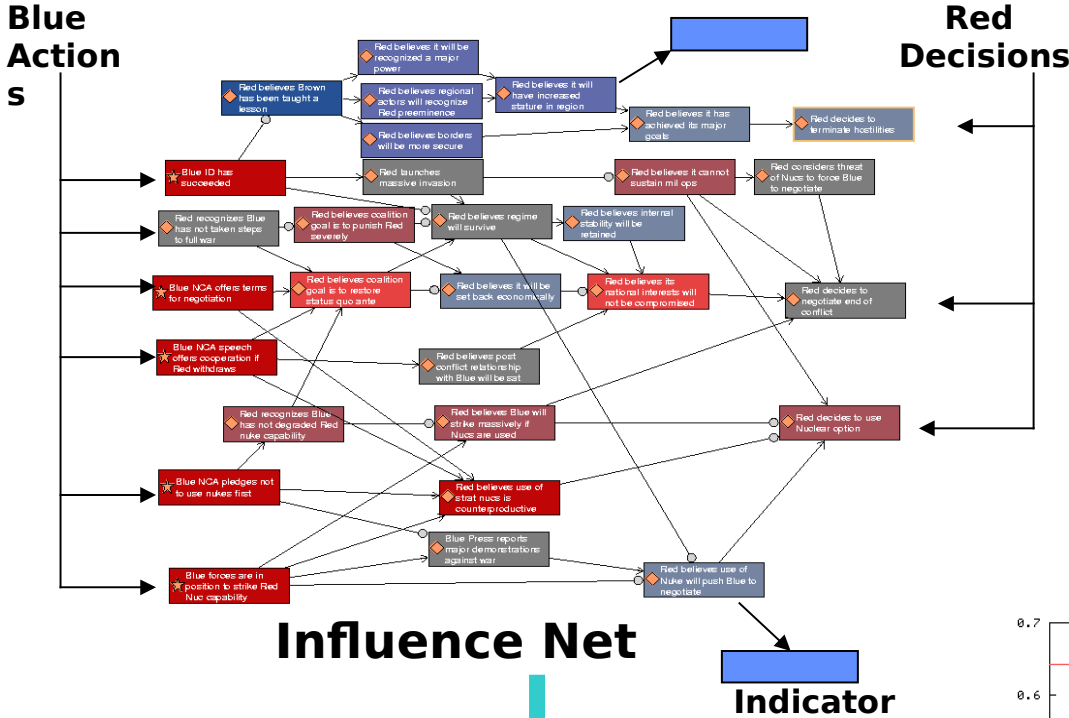


## Analyze Results



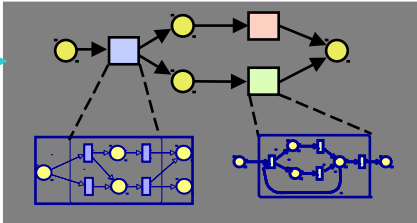


## EBO Approach to Homeland Defense



**COAs**  
**(actions/ times)**

## EXECUTABLE MODEL



## Indicator

**GMU**  
**George Mason**



# **SDT: ATD vs. Objective System**



## **Anticipated Capabilities**

- **Limited coverage of strategies, JFC/JFACC missions; Limited IW**
- **Limited COG/TS analysis; no Mission Analysis/Situation Development**
- **No COA analysis/comparison capability**
- **No JAOP development support past COA option development**
- **No CS (e.g., Logistics, Mobility), TACS, or Space considerations/Risk Analysis**

## **Required Capabilities**

- **Covers all strategy options**
- **Covers all JFC missions (e.g., HUMRO, PK/PE, etc.)**
- **Covers all JFACC missions (e.g., CA, SA, CL, etc.)**
- **Incorporates lethal/nonlethal, kinetic/non-kinetic applications of force**
- **Supports Joint Air Estimate Process through JAOP development (JP 3-30)**
- **Supports JFACC Daily Guidance planning (JP 3-30)**





# CAT: ATD vs. Objective System



## **Anticipated Capabilities**

- **Outcome assessment at Force and Campaign levels**
- **Limited ability to incorporate evidence**
- **Complete drilldown, predictive and reconstructive assessment**
- **Value-of-information ISO collection management and branch planning**

## **Required Capabilities**

- **Predictive assessment ISO COA development**
- **Assessment of outcomes ISO Engagement, Battle, Force and Campaign execution**
- **Reconstructive assessment of outcomes ISO plan refinement**
- **Incorporation of all-source information**
- **Drilldown to action, causes, and mechanism level**



# Summary



- **Definitional issue only a start**
  - **No approved dictionary let alone glossary or encyclopedia**
- **Ontology common to all applications**
  - **A common task but a common ontology server**
  - **Basis for library**
- **Not just EBO: IPB (Fusion), JBI, IW, TUT, TST, etc.**
- **Shared language essential to shared understanding**
  - **Shared understanding alone insufficient**





# ***Operation ALLIED FORCE***



# Operation Allied Force EBO Example (1)

(from DOD AAR)



Milosevic accedes to NATO's conditions  
(total **Desired Effect**)

**Air Attacks**  
(**Military Effect**)

Solidarity of NATO  
(**Diplomatic Effect**)

Russian Diplomacy  
(**Diplomatic Effect**)

Buildup of NATO Ground Power  
(**Military-Diplomatic Effect**)

Kosovar Albanian Attacks  
(**Military Effect**)

Sanctions, etc.  
(**Economic Effect**)



Expanded on Next Slide

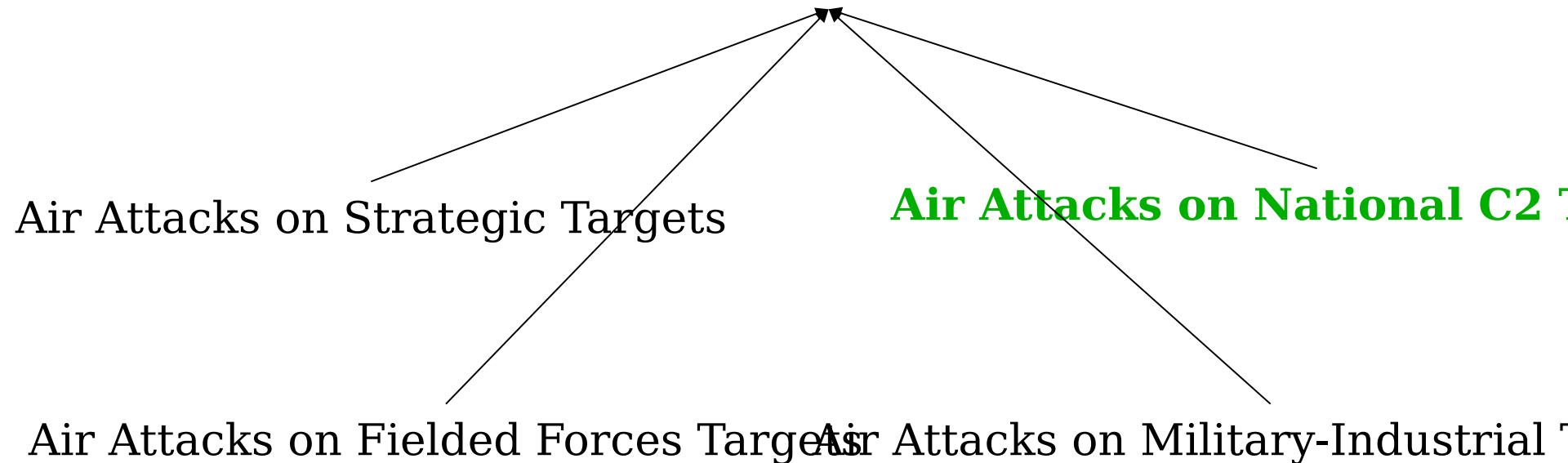


# Operation Allied Force EBO Example (2)

(from DOD AAR)



Milosevic accedes to NATO's conditions  
(total **Desired Effect**)



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# Operation Allied Force EBO Example (3)

(from DOD AAR)

